



# Fact Sheet

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## Subsurface Cavity and Tunnel Detection

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**Facts:** In the mid- to late 1960's, the Corps of Engineers addressed the problem of detection and mapping of Viet Cong intrusion and concealment tunnels, i.e., a military application. Detection of cavities and other features which can lead to ground collapse and threaten the foundation integrity of critical structures, e.g., power plants, dams, highways, bridges, large buildings, etc., led to the execution of major civilian application research programs in the 1970's and 1980's. Other research efforts have addressed cavity and tunnel detection requirements posed by military intrusion tunnels, tunnels for contraband infiltration, underground-based military assets, and anomalous seepage from water retention structures. Due to the problem's complexity, both military and civilian requirements for cavity and tunnel detection continue to the present time as drivers for geophysical technology research and development.

Major advances have been made in individual geophysical methods and integrated methods approaches. Microgravimetry, surface and borehole ground penetrating radar, electrical and electromagnetic methods, and acoustic resonance techniques are notable examples of geophysical methods which were significantly advanced by the Corps of Engineers Waterways Experiment Station as a result of cavity and tunnel detection programs. In addition to solving novel and difficult problems involving cavities and tunnels, major cost savings have resulted from application of the geophysical technology to such specific problems as anomalous seepage from water structures; examples of this application are such major projects as Beaver Dam, Arkansas, Patoka Dam, Kentucky (see photograph), and Mill Creek Dam, Washington.



Recently the concept of tunneling deterrents has evolved. Feasibility studies of tunneling activity are ongoing at the WES Tunnel Test Bed in Otay Mesa, California. Methods under evaluation include passive borehole seismic listening devices supplemented by crosshole EM gradiometry.

For additional information regarding subsurface cavity and tunnel detection, contact Mr. Robert F. Ballard, Jr., at 601-634-2201, or email [ballarr@wes.army.mil](mailto:ballarr@wes.army.mil), or Dr. Dwain K. Butler at 601-634-2127, or email (CEERD-GG).